Intro to Recommender Systems

IBM Developer

SKILLS NETWORK

What are recommender systems?

Recommender systems capture the pattern of peoples' behavior and use it **to predict what else they might want or like**.

Applications

- What to buy?
  - E-commerce, books, movies, beer, shoes
- Where to eat?
- Which job to apply to?
- Who you should be friends with?
  - LinkedIn, Facebook, ...
- Personalize your experience on the web
  - News platforms, news personalization

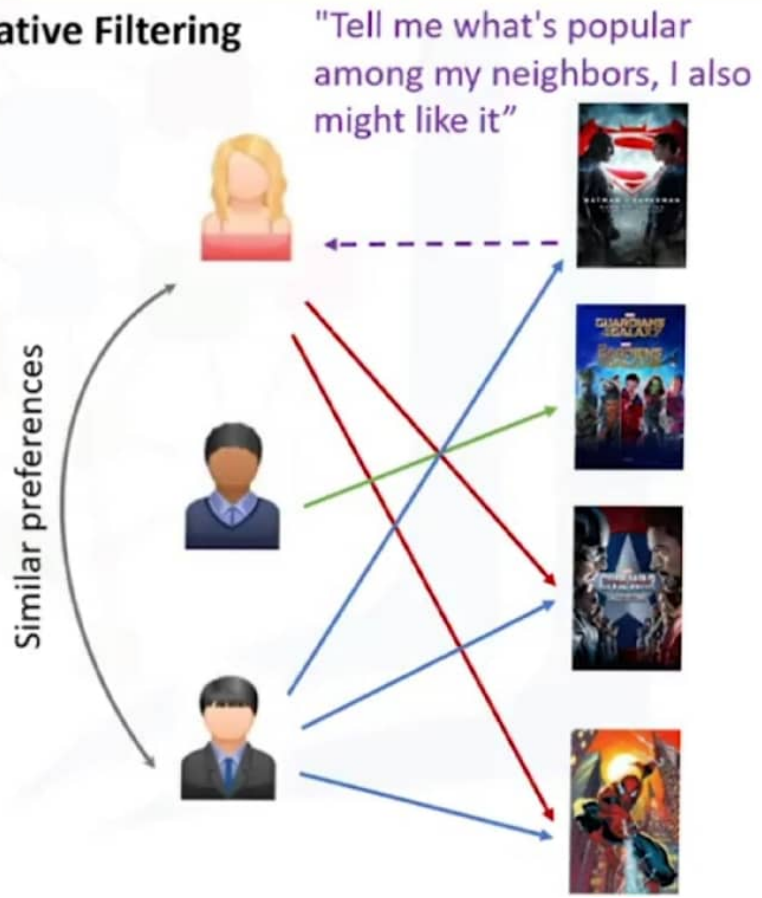
Advantages of recommender systems

- Broader exposure
- Possibility of continual usage or purchase of products
- Provides better experience

Two types of recommender systems

Content-Based

Collaborative Filtering



Implementing recommender systems

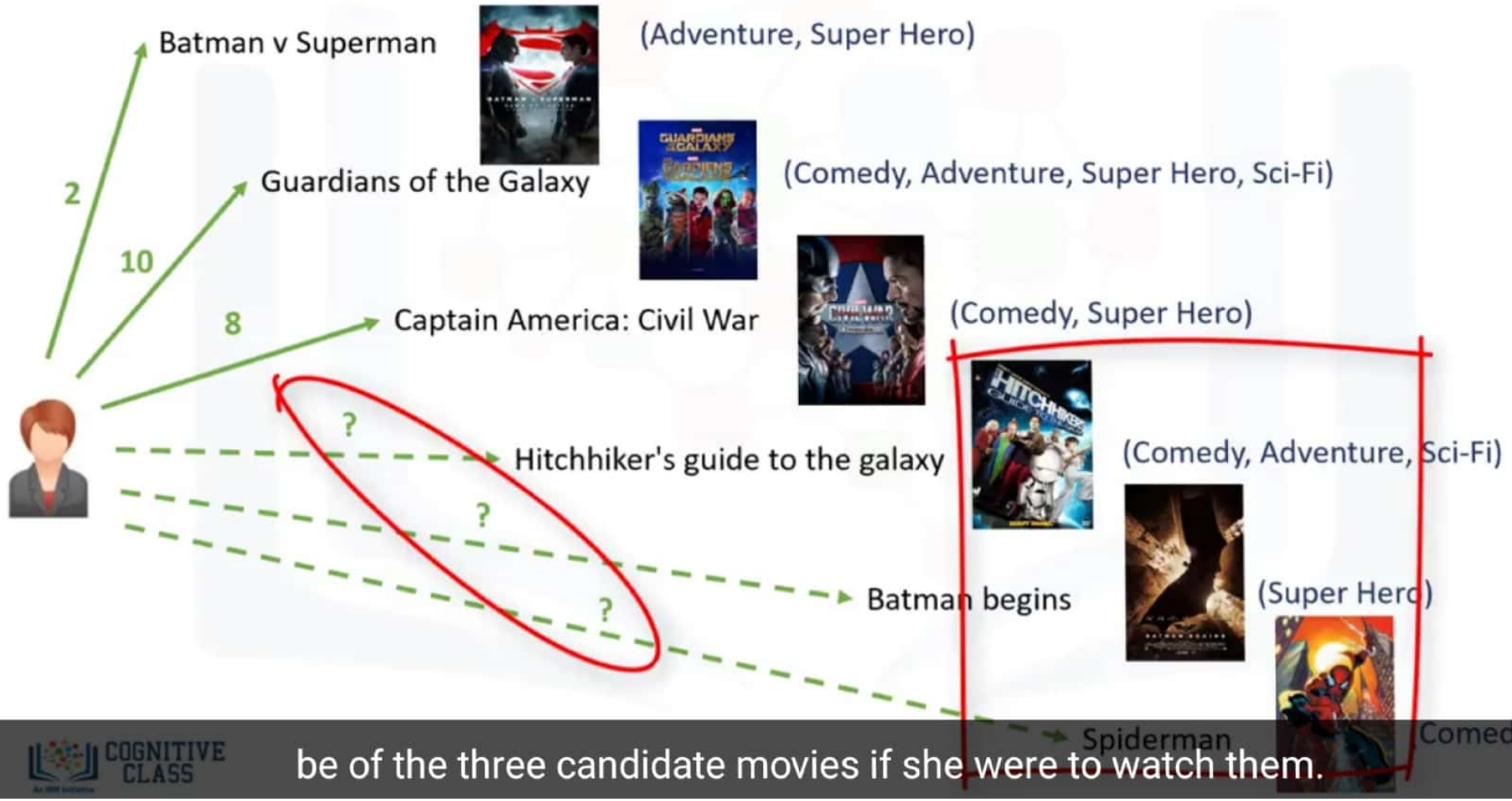
- Memory-based
  - Uses the entire user-item dataset to generate a recommendation
  - Uses statistical techniques to approximate users or items
    e.g., Pearson Correlation, Cosine Similarity, Euclidean Distance, etc.
- Model-based
  - Develops a model of users in an attempt to learn their preferences
  - Models can be created using Machine Learning techniques like regression, clustering, classification, etc.

Content-Based Recommender Systems

Saeed Aghabozorgi

Content-based recommender systems

Content-based recommender systems



be of the three candidate movies if she were to watch them.

Weighing the genres

	2
	10
	8

Input User Ratings

X

	Comedy	Adventure	Super Hero	Sci-Fi
	0	1	1	0
	1	1	1	1
	1	0	1	0

Movies Matrix

=

Weighted Genre Matrix

	Comedy	Adventure	Super Hero	Sci-Fi
	0	2	2	0
	10	10	10	10
	8	0	8	0

	Comedy	Adventure	Super Hero	Sci-Fi
				

Weighing the genres

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Input User Ratings

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Movies Matrix

=

Weighted Genre Matrix

	Comedy	Adventure	Super Hero	Sci-Fi
	0	2	2	0
	10	10	10	10
	8	0	8	0

	Comedy	Adventure	Super Hero	Sci-Fi
	0.3	0.2	0.33	0.16

User Profile

It clearly indicates that she likes superhero movies more than other genres.

Finding the recommendation

	Comedy	Adventure	Super Hero	Sci-Fi
	0.3	0.2	0.33	0.16

User Profile

	Comedy	Adventure	Super Hero	Sci-Fi
	1	1	0	1
	0	0	1	0
	1	0	1	0

Movies Matrix

=

	Comedy	Adventure	Super Hero	Sci-Fi
	0.3	0.2	0	0.16
	0	0	0.33	0
	0.3	0	0.33	0

Weighted Movies Matrix

Σ

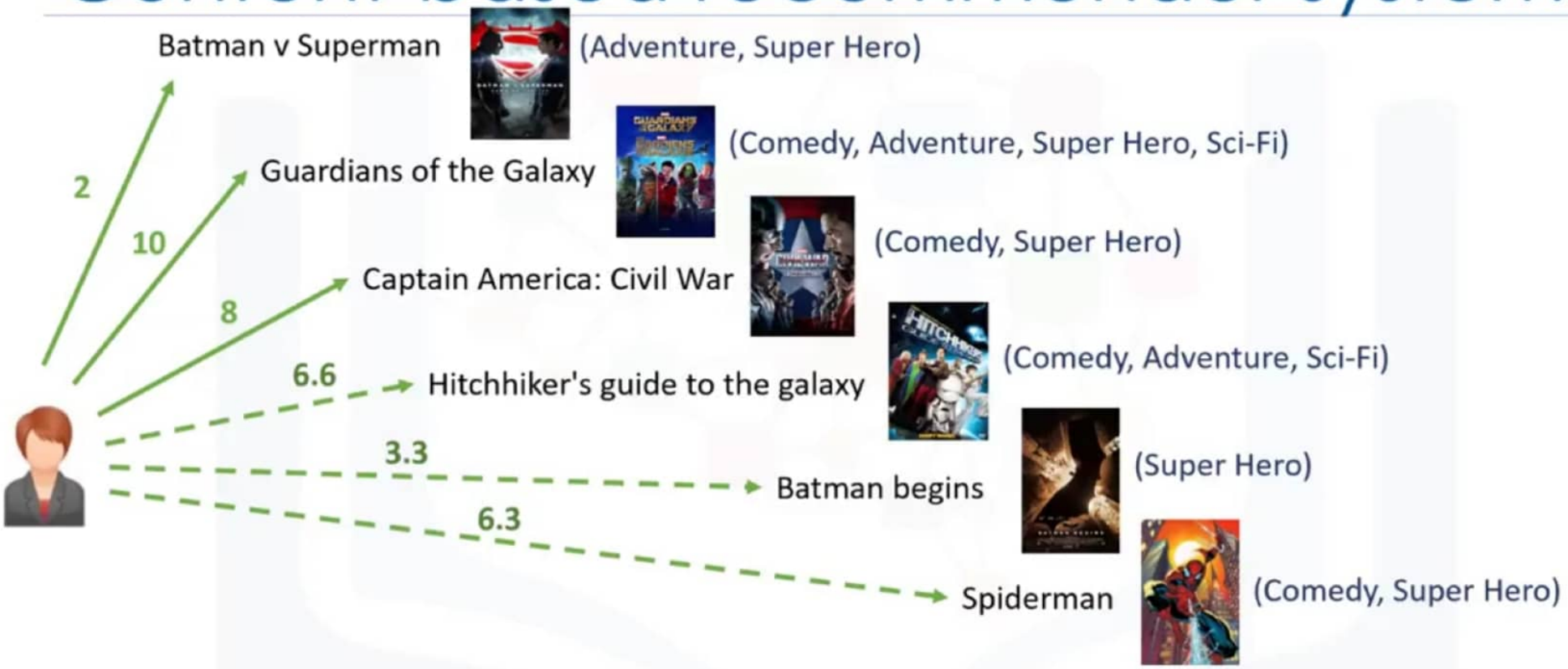
Weighted Average
0.66
0.33
0.63

Recommendation Matrix

COGNITIVE CLASS

For example, we can say that the Hitchhiker's Guide to the Galaxy

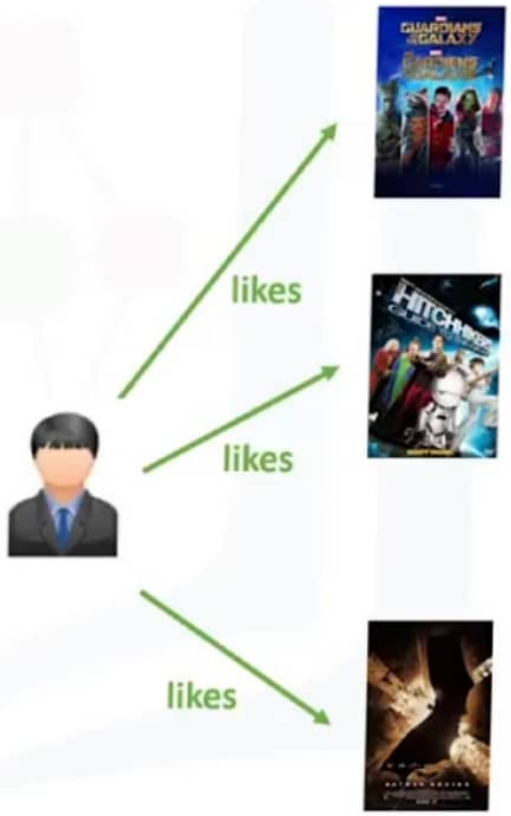
Content-based recommender systems



Content-based recommender systems

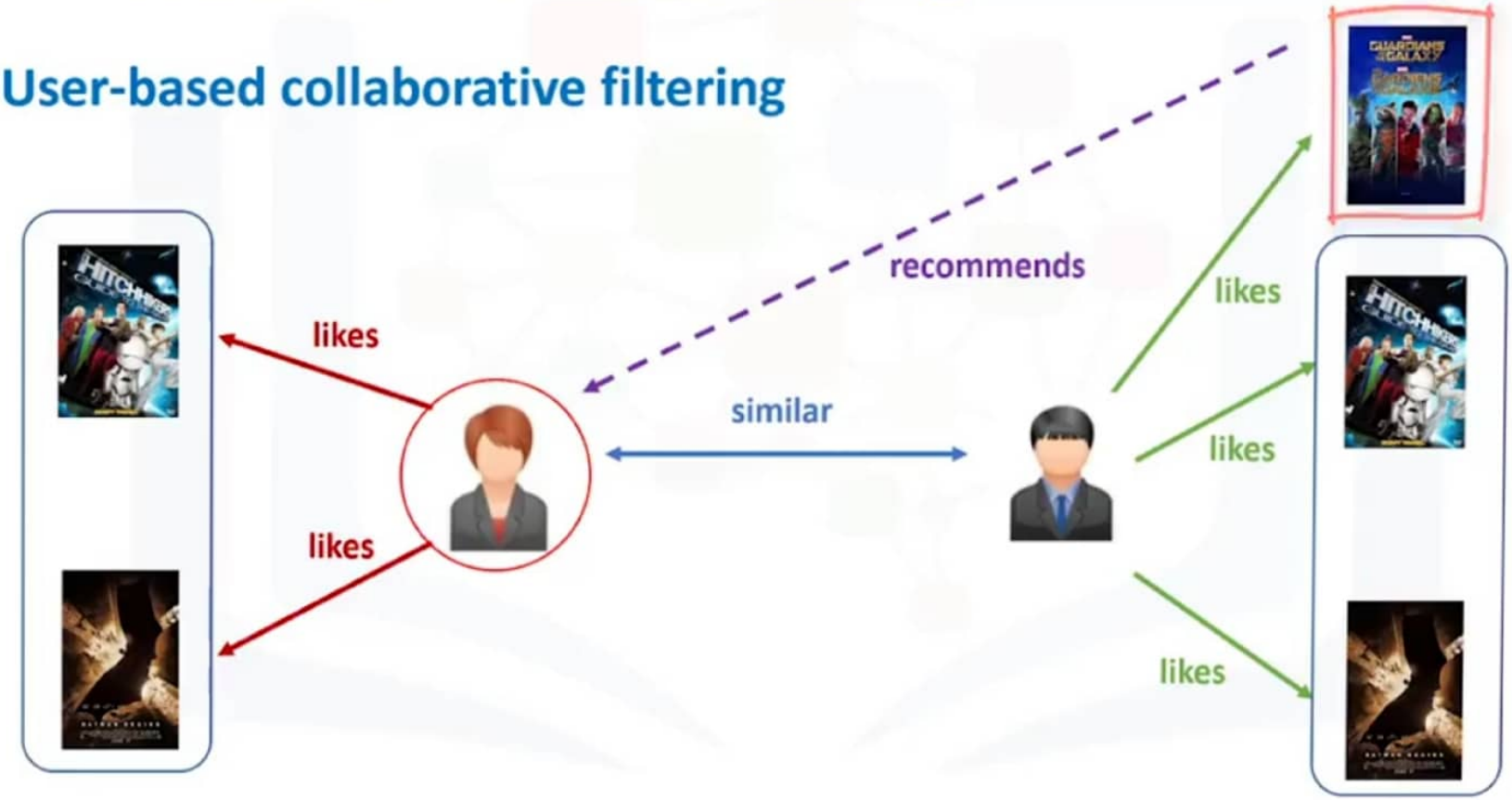
Collaborative filtering

- **User-based collaborative filtering**
  - Based on users' neighborhood
- **Item-based collaborative filtering**
  - Based on items' similarity

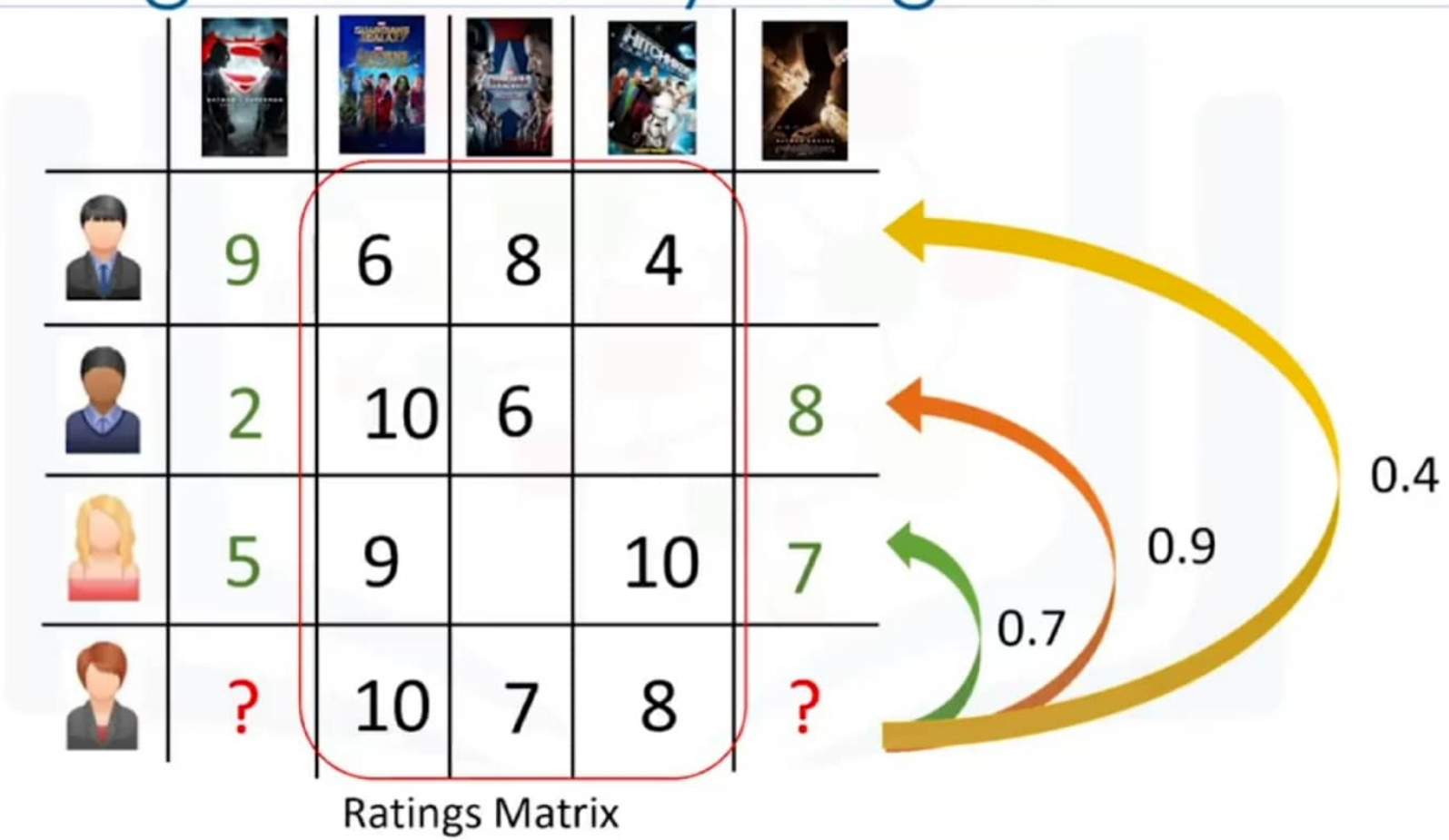


Collaborative filtering

- **User-based collaborative filtering**

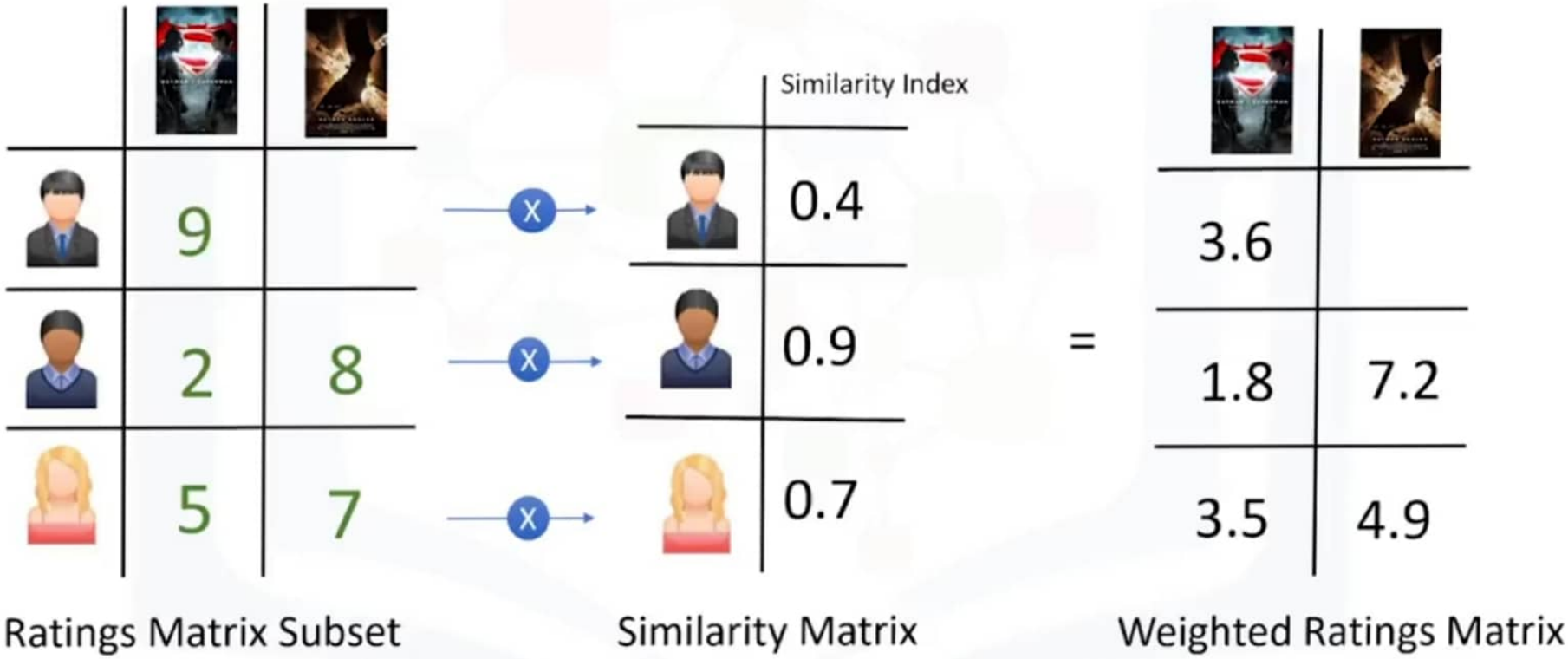


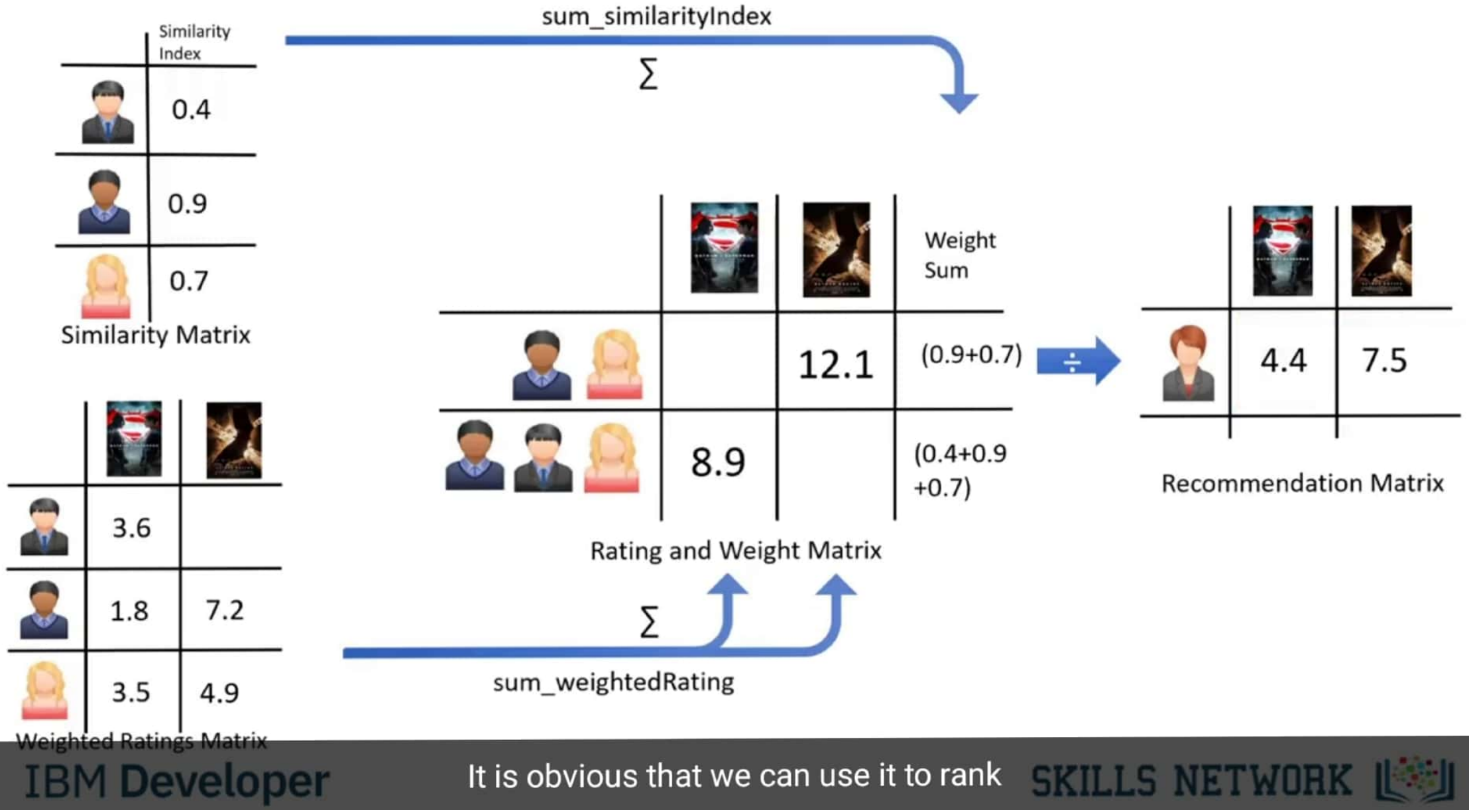
Learning the similarity weights



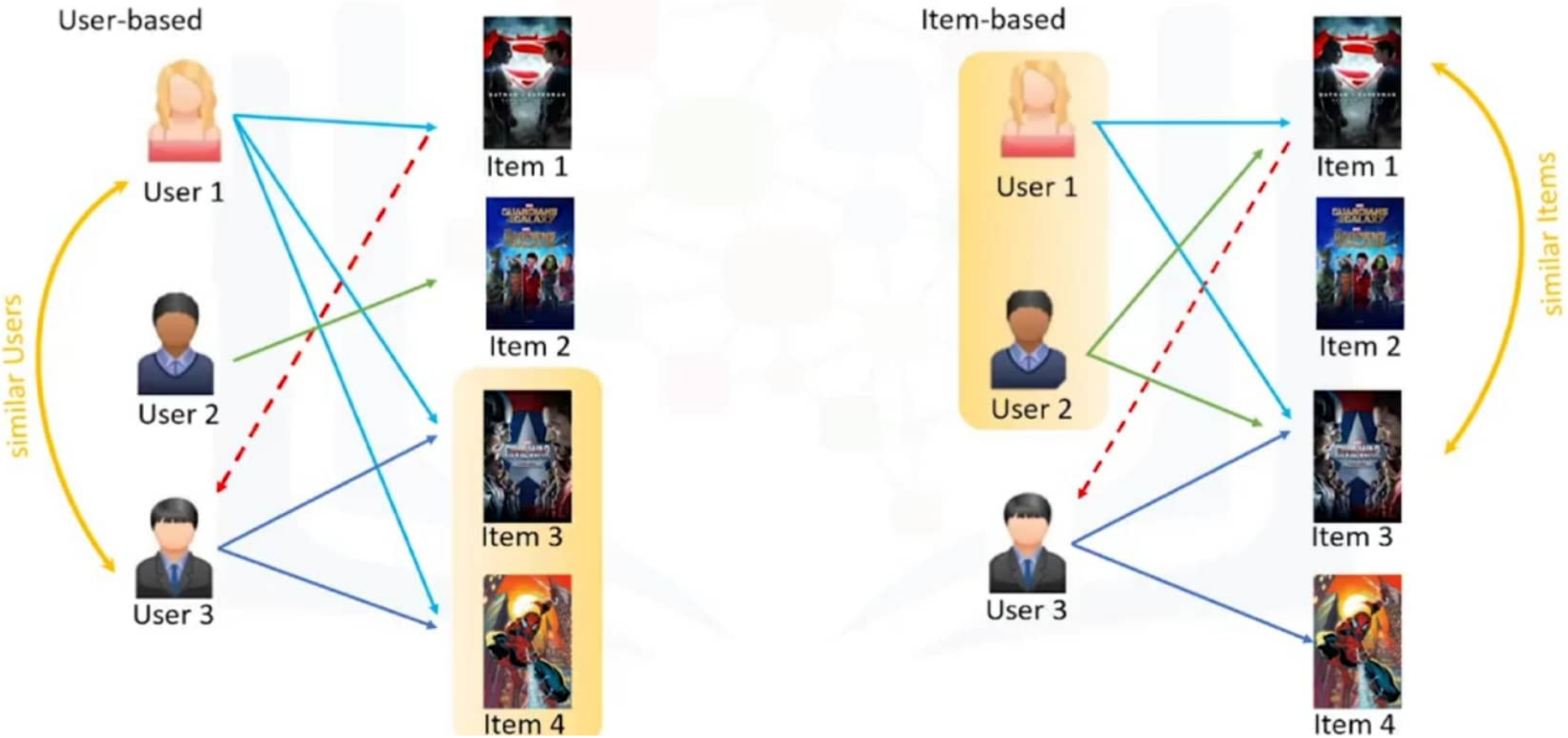
Ratings Matrix

Creating the weighted ratings matrix





Collaborative filtering



Challenges of collaborative filtering

- **Data Sparsity**
  - Users in general rate only a limited number of items
- **Cold start**
  - Difficulty in recommendation to new users or new items
- **Scalability**
  - Increase in number of users or items